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ATMOSPHERIC ELEMENTAL CARBON: LONG-TERM TRENDS AND IMPACT ON CLIMATE CHANGE

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Elemental or black carbon (EC) aerosols are a major fraction of fine particulate matter, absorb sunlight resulting in the heating of the atmosphere and are associated with pulmonary and cardiovascular diseases. Long-term atmospheric EC concentrations, [EC]atm, are needed to validate the climate models used to predict future temperature of the earth. Such data are however, sparse. The objective of this study is to determine the long-term [EC]atm and use it to verify the models. A new approach is used to directly determine [EC]atm. Assuming dry and wet deposition as the only source of EC to the lakes, concentration of EC in sediments, [EC]sed, is related to [EC]atm by [EC]sed = K [EC]atm, where K (m3g-1) is a constant for a given lake. [EC]atm is determined from filters papers collected daily at Whiteface Mountain, NY from 1978 to 2005 using thermal optical method. Sediment cores (~ 60 cm) were collected from West Pine Pond and within the same air-shed as Whiteface Mountain. EC from the sediment was chemically separated and determined using the thermal optical method. The ages of the sediments were determined using 210Pb dating technique. The annual mean [EC]atm for 1978-1986, 1987-1996 and 1997-2005 period were 550, 225 and 65 ngm-3, respectively. From [EC]atm and [EC]sed data for the period 1978-2005, K was determined to be 10400±4600 m3g-1. With this value of K, [EC]atm were determined going back from 1835 to 1977. The results are then compared with EC emissions obtained from model calculations.